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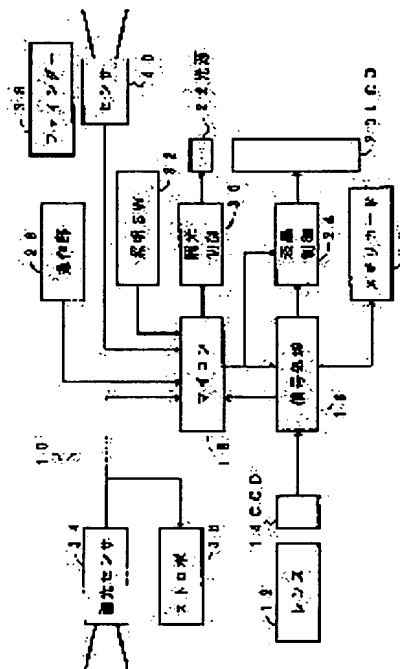
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## (54) ELECTRONIC EQUIPMENT PROVIDED WITH REFLECTION TYPE LIQUID CRYSTAL DISPLAY

## (57)Abstract:

PROBLEM TO BE SOLVED: To drastically reduce power consumption and also to automatically provide an optimum display definition a user does not perform any complicated adjusting operation in an electronic equipment provided with reflection type liquid crystal display.

SOLUTION: This equipment is provided with a light source 22 illuminating the display screen of a reflection type liquid crystal display(LCD) 20, and performs the ON/OFF control of the light source 22 and also automatically controls the illuminating light quantity of the source 22 based on the brightness of surroundings detected by means (for example, a CCD 14, a strobe light control sensor 34, a photosensor 40) for detecting an outer light quantity. Moreover, when the light source is not used, the device suppresses wasteful power consumption by turning off the LCD 20 automatically under a situation where the surroundings is so dark that the screen of the display can not be identified.



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**CLAIMS**


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**[Claim(s)]**

[Claim 1] The electronic equipment which it had in the reflected type liquid crystal display characterized by to establish a lighting means illuminate the display screen of a reflected type liquid crystal display, a detection means detect a surrounding luminosity, and a control means perform lighting / putting out lights of the aforementioned lighting means, or quantity of light adjustment of lighting light according to the luminosity detected with the aforementioned detection means, in the electronic equipment which makes a reflected type liquid crystal display a display.

[Claim 2] Electronic equipment equipped with the reflected type liquid crystal display characterized by establishing a detection means to detect a surrounding luminosity, and a control means to perform ON/OFF of the aforementioned reflected type liquid crystal display, or contrast adjustment of the display screen according to the luminosity detected with the aforementioned detection means, in the electronic equipment which makes a reflected type liquid crystal display a display.

[Claim 3] The image pick-up element changed into the picture signal which carries out the photo electric translation of the photographic subject light which carries out incidence through a lens, and shows a photographic subject image, The reflected type liquid crystal display used as a display means, and a lighting means to illuminate the display screen of the aforementioned reflected type liquid crystal display, a detection means to detect a surrounding luminosity, and a control means to perform lighting / putting out lights of the aforementioned lighting means, or quantity of light adjustment of lighting light according to the luminosity detected with the aforementioned detection means — since — the electronic camera equipped with the reflected type liquid crystal display characterized by changing

[Claim 4] the image pick-up element which changes into the picture signal which carries out the photo electric translation of the photographic subject light which carries out incidence through a lens, and shows a photographic subject image, the reflected type liquid crystal display which are used as a display means, a detection means detect a surrounding luminosity, and a control means perform the ON/OFF of the aforementioned reflected type liquid crystal display, or contrast adjustment of the display screen according to the luminosity which detected with the aforementioned detection means — since — the electronic camera equipped with the reflected type liquid crystal display characterized by to change

[Claim 5] The electronic camera equipped with the reflected type liquid crystal display according to claim 3 or 4 characterized by making a stroboscope modulated light sensor serve a double purpose as the aforementioned detection means.

[Claim 6] The aforementioned detection means is the electronic camera equipped with the reflected type liquid crystal display of the claim 3 characterized by consisting of the aforementioned image pick-up element and a digital disposal circuit.

[Claim 7] The electronic camera equipped with the reflected type liquid crystal display according to claim 3 or 4 by which it is providing [ the 2nd control means which turns off the aforementioned reflected type liquid crystal display when it is detected that the photography person is peeping into the aforementioned optical finder by the optical finder, the 2nd detection means which detects whether the photography person is peeping into the aforementioned optical finder, and the detection means of the above 2nd ] characterized.

[Claim 8] The detection means of the above 2nd is the electronic camera equipped with the reflected type liquid crystal display according to claim 3 or 4 characterized by consisting of a photodetection sensor and being made serve a double purpose as a detection means of the above 1st.

[Claim 9] The electronic camera equipped with the reflected type liquid crystal display according to claim 3 or 4 characterized by having the 3rd control means which performs adjustment which raises the contrast of the display screen of the aforementioned reflected type liquid crystal display when it is detected by the 3rd detection means which detects a backlight based on a brightness distribution of a photographic subject, and the detection means of the above 3rd that it is a backlight.

[Claim 10] The electronic camera equipped with the reflected type liquid crystal display according to claim 3 characterized by having the 3rd control means which performs adjustment which is made to turn on the aforementioned lighting means when it is detected by the 3rd detection means which detects a backlight based on a brightness distribution of a photographic subject, and the detection means of the above 3rd that it is a backlight, or raises the quantity of light of the aforementioned lighting means.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the electronic equipment equipped with the reflected type liquid crystal display as a display like electronic cameras, such as a digital camera, or the information personal digital assistant.

[0002]

[Description of the Prior Art] Conventionally, the penetrated type liquid crystal display is used as monitor display of a digital camera. However, a penetrated type liquid crystal display must always supply electric power to a back light, and has the fault that power consumption is large. On the other hand, the electronic camera indicated by JP,8-242398,A has a photometry means to measure photographic subject brightness, and is aiming at enhancement in power-saving-izing and monitor visibility by carrying out the automatic regulation of the luminosity of a back light according to photographic subject brightness.

[0003]

[Problem(s) to be Solved by the Invention] However, even if it adjusts the luminosity of a back light as indicated by the above-mentioned official report, the effect contributed to power saving is small, and when attaining further low-power-ization, there is a limitation in using a penetrated type liquid crystal display. Therefore, it replaces with a penetrated type liquid crystal display, and adoption of the unnecessary reflected type liquid crystal display of a back light is considered. Although a reflected type liquid crystal display has an advantage of the parvus in power consumption, there is a fault that a screen seldom appears, in the dark location. Therefore, in order to use a reflected type liquid crystal display, the periphery needs to take the characteristic cure of illuminating a liquid-crystal-display side by the fill-in flash in a dark environment.

[0004] this invention was not made in view of such a situation, and even if it cuts down power consumption sharply and a user does not do complicated adjustment operation etc., it aims at offering electronic equipment equipped with the reflected type liquid crystal display which can acquire the optimum display status automatically.

[0005]

[Means for Solving the Problem] In order to attain the aforementioned purpose, it carries out that invention according to claim 1 established a lighting means illuminate the display screen of a reflected type liquid crystal display, a detection means detect a surrounding luminosity, and a control means perform lighting / putting out lights of the aforementioned lighting means, or quantity of light adjustment of lighting light according to the luminosity detected with the aforementioned detection means, in the electronic equipment which makes a reflected type liquid crystal display a display as the characteristic feature.

[0006] According to this invention, a surrounding luminosity is detected with a detection means, in being bright enough, it switches off a lighting means, and when the periphery is dark, the periphery turns on a lighting means, illuminates the display screen of a reflected type liquid crystal display, and makes a screen legible. Moreover, according to the luminosity detected with a detection means, the lighting quantity of light of a lighting means is adjusted suitably, and it may be made to obtain a more legible screen display also besides only controlling ON/OFF of a lighting means. Thereby, while power-saving-ization can be attained, the optimum display quality can be offered automatically.

[0007] Invention according to claim 2 is characterized by establishing a detection means to detect a surrounding luminosity, and a control means to perform ON/OFF of the aforementioned reflected type liquid crystal display, or contrast adjustment of the display screen according to the luminosity detected with the aforementioned detection means in the electronic equipment which makes a reflected type liquid crystal display a display. When not using a lighting means, this invention perceives the point that a reflected type liquid crystal display cannot be used, and is made in the dark location. That is, under the status that the periphery cannot discriminate the display screen darkly, in being bright enough, while a surrounding luminosity is detected with a detection means, and the periphery turns on a reflected type liquid crystal display, since a reflected type liquid crystal display cannot be used, it turns off this and is holding down useless power consumption the place of a join office.

[0008] Moreover, it is also effective to carry out the optimum control of the contrast of a reflected type liquid crystal display suitably according to the grade of a surrounding luminosity according to the luminosity detected with a detection means by contrast adjustment since the display screen may become legible enough. As indicated to the claim 3 or the claim 4, these invention indicated to the claim 1 and the claim 2 can carry out the photo electric translation of the photographic subject light which carries out incidence through a lens, and can apply it to the electronic camera possessing the image pck-up element changed into the picture signal which shows a photographic subject image. In this case, as indicated to the claim 5 or the claim 6, it is desirable to make AE photometry means which consists of the stroboscope modulated light sensor attached to an electronic camera, the photometry sensor for a denudation control, or an image pck-up element and a digital disposal circuit serve a double purpose as the aforementioned detection means.

[0009] In the electronic camera concerning the claim 3 or the claim 4, invention according to claim 7 is characterized by establishing the 2nd control means which turns off the aforementioned reflected type liquid crystal display, when it is detected that the photography person is peeping into the aforementioned optical finder by the 2nd detection means which detects further whether the photography person is peeping into the optical finder and the aforementioned optical finder, and the detection means of the above 2nd.

[0010] Since the energization to a reflected type liquid crystal display was intercepted when it detected with a detection means whether the photography person is peeping into the optical finder and the photography person was peeping into the optical finder, useless power consumption can be suppressed. Moreover, it is desirable to use a photodetection sensor for the detection means

of the above 2nd, and to make this serve a double purpose as a detection means for detecting a surrounding luminosity like a claim 8, especially. In addition, the control means and the thing of one in the electronic camera concerning the claim 3 or 4 are sufficient as the 2nd control means.

[0011] In the electronic camera concerning the claim 3 or the claim 4, invention according to claim 9 is characterized by establishing the 3rd control means which performs adjustment which raises the contrast of the display screen of the aforementioned reflected type liquid crystal display, when it is detected by the 3rd detection means which detects a backlight based on a brightness distribution of a photographic subject, and the detection means of the above 3rd that it is a backlight. According to the mode which added such a configuration, according to an operating condition, the more nearly optimum display status can be offered automatically, without forcing complicated adjustment operation etc. upon a user (user). In addition, the control means and the thing of one in the electronic camera concerning the claim 3 or 4 are sufficient as the 3rd control means.

[0012] Moreover, the mode according to claim 10 which establishes like and 3rd control means to perform adjustment which is made to turn on the aforementioned lighting means when it is detected by the 3rd detection means which detects a backlight based on a brightness distribution of a photographic subject, and the detection means of the above 3rd in addition to the configuration of the electronic camera concerning a claim 3 that it is a backlight, or raises the quantity of light of the aforementioned lighting means is also possible.

[0013]

[Embodiments of the Invention] It explains in full detail about the gestalt of desirable operation of electronic equipment equipped with the reflected type liquid crystal display which starts this invention below according to an accompanying drawing. Drawing 1 is a block diagram showing the configuration of the electronic camera concerning the gestalt of operation of this invention. As shown in this drawing, this electronic camera 10 consists of the light source 22 which mainly gives the fill-in flash which illuminates the display screen of a taking lens 12, the solid state image pickup device (CCD) 14, the digital disposal circuit 16, the microcomputer (microcomputer) 18, the reflected type liquid crystal display (LCD) for the color 20, and aforementioned LCD20.

[0014] Image formation of the picture image light which shows a photographic subject is carried out to the light-receiving side of CCD14 through a taking lens 12. CCD14 changes into the signal charge of an amount according to the quantity of light the picture image light by which image formation was carried out to the light-receiving side. In this way, the accumulated signal charge is transmitted one by one based on the driving pulse added from CCD drive circuit (un-illustrating), and is read as a voltage signal (picture signal) according to the signal charge.

[0015] The picture signal read from CCD14 is added to a digital disposal circuit 16, and signal processing of color separation, a gain adjustment, gamma correction, and A/D-conversion others is performed here. After the image data generated by the digital disposal circuit 16 decodes, it is supplied to LCD20 through the liquid crystal control circuit 24. In this way, the picture which CCD14 caught is displayed on LCD20.

[0016] Before acceptance of the photography start signal emitted from the release switch of a control unit 26 etc., a preview picture image (the animation or intermittent drawing which is carrying out the monitor before this image pick-up) is displayed on LCD20, and the picture signal read from CCD14 when the photography start signal was accepted displays a still picture on LCD20, after passing through predetermined processing in a digital disposal circuit 16. Simultaneous with this, or after ending a display of a still picture, compression processing of this image data is carried out if needed, and it is recorded on record media, such as a memory card 28. In addition, various gestalt, such as SmartMedia and an IC card, may be possible for the gestalt of a record medium, and not only the external record medium it can detach [ record medium ] freely but an internal memory is sufficient. Moreover, a photography start signal may be added from the exterior of an electronic camera 10 like remote control or an external connection device. If above-mentioned record processing is completed, a frieze of a screen will be canceled and it will return to an animation or an intermittent drawing display.

[0017] Moreover, the image data saved on the memory card 28 can be read based on a control of a microcomputer 18, and after carrying out extension processing of the read image data if needed, it is outputted to LCD20 through the liquid crystal control circuit 24. In this way, a regeneration picture image is displayed on LCD20. one pair which has a display electrode fundamentally although the detailed structure of LCD20 is not illustrated — transparent — liquid crystal is enclosed with a wooden floor, a film phase contrast plate and a polarizing plate are arranged on the outside, and it consists of the structure which prepared the reflecting plate in the field of an opposite side the incident-light side And it displays by reflecting the beam of light using a surrounding light. Although this LCD20 is controlled by the microcomputer 18 through the liquid crystal control circuit 24 and being mentioned later in detail, according to a brightness distribution of a surrounding luminosity and a photographic subject, adjustment of contrast is performed automatically. Moreover, when the periphery is dark, the light source 22 is turned on and the display screen of LCD20 is illuminated. It is possible to use various gestalt, such as a fluorescence spool, Light Emitting Diode, and a white LGT, for the light source 22.

[0018] While the light source 22 is controlled by the microcomputer 18 through the modulated light control circuit 30 and lighting/putting out lights is automatically performed according to a surrounding luminosity, adjustment of the brightness (quantity of light of irradiation light) of the light source is performed. if the lighting switch 32 for a manual operation on the other hand is also formed and an user operates this switch, a microcomputer 18 gives priority to designation of the lighting switch 32 over light source automatic-control processing — making — switch operation — following — the light source 22 — ON/OFF — or it adjusts. Thereby, an user embraces the need, and can turn on, switch off / modulate the light of the light source 22 at any time.

[0019] A microcomputer 18 carries out the generalization control of each circuit based on the switch operation from the control units 26, such as a power switch and a release switch, performs a drive control of CCD14, and an R/W control of the memory card 28, and also performs various operations, such as exposure value and a focal position, according to a predetermined algorithm, and controls an automatic exposure control, auto-focusing, an auto stroboscope, an auto white balance, etc.

[0020] That is, a microcomputer 18 asks for a photographic subject's luminosity (photographic subject brightness) and a brightness distribution based on the addition average of the picture signal outputted from a digital disposal circuit 16, the present drawing value, and electronic shutter speed. And while the charge storage time (electronic shutter speed) of a drawing value or CCD14 is extracted based on the drawing value determined and determined based on the luminosity of the photographic subject which asked and a device is controlled, CCD drive circuit is controlled based on electronic shutter speed.

[0021] Thus, by processing the output signal from CCD14 by the digital disposal circuit 16, a photographic subject's luminosity, i.e., a surrounding luminosity, is detected, and the light source 22 and LCD20 are controlled based on the detection result. In addition, the photometry element which may prepare the photometry element of not only this but exclusive use, and is made serve a double purpose as an exposure meter is sufficient as a means to detect a surrounding luminosity. Moreover, what gestalt is sufficient, as long as it may make the modulated light sensor for stroboscopes 34, and the photodetection sensor 38 of the

optical finder 38 serve a double purpose and it can detect a surrounding luminosity (the amount of outdoor daylight).

[0022] Although various gestalt is possible for the autofocus means, for example, the focal evaluation value which shows the sharpness of a photographic subject image from a picture signal is calculated, it is based using the focal evaluation value, and a focal position is computed. And according to the computed focal position, a taking lens 12 is controlled through a focal drive circuit (un-illustrating), and a focal position is set up. In addition, you may use well-known ranging means, such as AF sensor.

[0023] Moreover, a microcomputer 18 controls a stroboscope 36 according to the luminosity of the periphery detected by the stroboscope modulated light sensor 34. The photodetection sensor 40 is formed near the eye contacting part (inspection hole) of the optical finder 38. This photodetection sensor 40 is a means to detect whether the photography person peeped into the optical finder 38, for example, a photo sensor is used. If a photography person's face approaches a finder eye contacting part, it will detect whether the photography person is peeping into the optical finder 38 using the eye contacting part circumference becoming a photography person's negative, and the sensor acceptance quantity of light changing.

[0024] In addition, when a photography person's face approaches a finder eye contacting part using the photodetection sensor 40 which consists of the photogenesis section and the light-receiving section, the configuration of detecting whether the photography person peeping into the optical finder 38 based on change of the quantity of light in which it is reflected by a photography person's face and the light by which the outgoing radiation was carried out from the photogenesis section carries out incidence to the light-receiving section may be used. The detecting signal of the photodetection sensor 40 is notified to a microcomputer 18, and a microcomputer 18 performs the control which turns off LCD20 and the light source 22 compulsorily through the liquid crystal control circuit 24 and the modulated light circuit 30, while the photography person is peeping into the optical finder 38.

[0025] Next, an operation of the constituted electronic camera is explained like the above. Drawing 2 is a flow chart which shows a control flow in a microcomputer. Sensor detection processing in which a surrounding luminosity is detected using CCD14, the digital disposal circuit 16, etc. is performed (step S110), and it judges whether the detected luminosity is brighter than a predetermined luminosity (reference value of the boundary which turns on the light source 22) (step S112). Since it is not necessary to give a fill-in flash to LCD20 when it is judged that an ambient light is fully bright and can fully discriminate LCD20 only with a surrounding light, the putting-out-lights control of the light source 22 is carried out (step S114).

[0026] On the other hand, when it judges with the periphery being a dark environment, the light source 22 is made to turn on in decision of step S112 that a fill-in flash should be given to LCD20 (step S116). And according to the grade of a surrounding luminosity, the brightness of a fill-in flash is adjusted through the modulated light control circuit 30 (step S118). The brightness of a fill-in flash is also decreased as the brightness of a fill-in flash is raised and it becomes bright so that the periphery is dark. In this way, a display becomes legible with the display screen of LCD22 being illuminated with the light source 22.

[0027] Processing of the above-mentioned step S110 - step S118 is periodically performed in a fixed cycle (step S120). Or step S110 - step S118 are processed to a power up, and when some switch operations, such as half-push of a release switch and regeneration coma delivery designation, are performed after that, you may be made to perform processing of step S110 - step S118.

[0028] Thus, the optimum display quality suitable for the status can be offered, without being able to attain power-saving-ization and forcing complicated adjustment operation upon an user, since according to the electronic camera 10 of this example a surrounding luminosity is detected, the light source 22 is automatically turned on only when dark, and the brightness is moreover adjusted to a proper value according to the grade of a luminosity.

[0029] Moreover, a split photometry is performed in a photometry means, a brightness distribution of a photographic subject is grasped, a backlight is detected by measuring main photographic subjects' brightness and brightness of the periphery, the lighting control of the light source 22 may be carried out at the time of a backlight detection, or the control which raises the quantity of light of the lighting light may be performed. Furthermore, it is desirable to perform the control which makes the contrast of LCD20 raise automatically in backlight photography. In addition, not only a backlight but when a part of screen becomes very bright like spot light, it is good to perform automatic contrast adjustment.

[0030] In the gestalt of operation mentioned above, although the electronic camera equipped with the light source 22 which gives a fill-in flash to LCD20 was explained to the example, the gestalt which does not use the light source 22 is also considered. In this case, as shown in drawing 3, sensor detection processing in which a surrounding luminosity is detected using CCD14, the digital disposal circuit 16, etc. is performed (step S130), and it judges whether the detected luminosity is brighter than a predetermined luminosity (reference value of the boundary which becomes unable to discriminate the screen of LCD20) (step S132). When it is judged that an ambient light is fully bright and can fully discriminate LCD20 only with a surrounding light, while LCD20 is turned on (step S134), contrast is adjusted according to a detection of a backlight or spot light (step S136).

[0031] On the other hand, in decision of step S112, since a display cannot be recognized the place of a join office even if it energizes to LCD20 when it judges with it being such a dark environment that the periphery's not display being [ of LCD20 ] discriminable, energization to LCD20 is intercepted (step S138). (OFF) Processing of the above-mentioned step S130 - step S138 is periodically performed in a fixed cycle (step S140). Or step S130 - step S138 are processed to a power up, and when some switch operations, such as half-push or regeneration coma delivery designation of a release switch, are performed after that, you may be made to perform processing of step S130 - step S138.

[0032] Thus, since according to the electronic camera which performs the control shown in drawing 3 a surrounding luminosity is detected, and it turns off LCD20 in being dark, useless power consumption can be suppressed. Moreover, in especially the photography mode, when LCD20 is turned off, it is desirable to also stop a drive of CCD14 collectively and to attain much more power-saving-ization. In this case, when CCD14 is made to reboot by half-push of a release switch or the optical finder 38 is peeped into, when the photodetection sensor 40 adopts the sequence of detecting this and making a drive of CCD14 resume etc., it is enabled to take a photograph also in a dark environment.

[0033] With the gestalt of the above-mentioned implementation, although the electronic camera was explained to the example, this invention is widely applicable to the electronic equipment of not only an electronic camera but a portable television set, a TV phone machine, a Personal Digital Assistant, and others. The application on the portable electronic equipment which uses a cell especially is effective.

[0034]

[Effect of the Invention] According to electronic equipment equipped with the reflected type liquid crystal display which starts this invention as explained above, since the surrounding luminosity was detected, the lighting means was switched off when the periphery was bright, and it was made to turn on a lighting means only when the periphery was dark, power-saving-ization can be attained. Therefore, the prolonged use by the cell is attained. Moreover, since the quantity of light of a lighting means was

automatically adjusted according to the grade of a surrounding luminosity, a photography person does not need to adjust lighting light according to a surrounding luminosity, and convenience improves.

[0035] According to electronic equipment equipped with the reflected type liquid crystal display concerning a claim 2, since the reflected type liquid crystal display was turned off, under the status that the periphery is dark, useless power consumption can be held down, so that a scope is not discriminable. Moreover, since it was made to carry out the automatic regulation of the contrast according to the brightness distribution of the grade of a surrounding luminosity and a photographic subject, complicated adjustment operation becomes unnecessary.

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[Translation done.]

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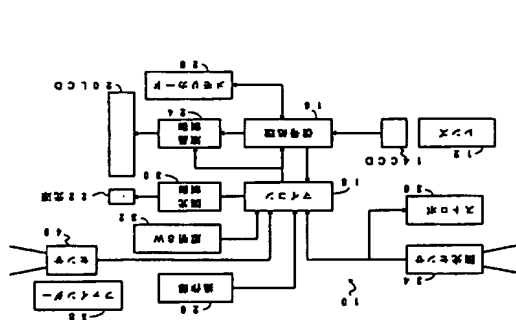
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(22) 出願日	平成10年6月23日 (1998. 6. 23)	(72) 発明者	石川 嘉洋 埼玉県川口市南栄町中保210番地 埼玉県川口市南栄町3丁目11番46号 富士号 富士フイルム株式会社内 100083118 弁理士 松浦 隆三

(54) 発明の名称 反射型液晶ディスプレイを備えた電子機器

(57) 要約  
【課題】 反射型液晶ディスプレイを備えた電子機器において、消費電力を大幅に削減し、且つ、使用者が複雑な調整操作等をしなくても自動的に最適な表示品位を確保する。

【解決手段】 反射型液晶ディスプレイ (LCD) 20の表示画面を照明する光源22を設け、外光量を検出する手段 (例えば、CCD14、ストロボ露光センサ34、光検出センサ40等) で検出した周囲の明るさに基づいて、光源22をON/OFF制御すると共に、その照明光量を自動調整する。また、光源22を使用しない場合は、ディスプレイの画面を遮断できない様に画面が暗い状態でLCD20を自動的にOFFして、無駄な電力消費を抑える。



【特許請求の範囲】  
【請求項1】 反射型液晶ディスプレイを表示部とする電子機器において、  
反射型液晶ディスプレイの表示画面を照明する照明手段と、  
周囲の明るさを検出する検出手段と、  
前記検出手段で検出した明るさに応じて、前記照明手段の点灯/消灯、または照明光の光量調整を行う制御手段と、  
を設けたことを特徴とする反射型液晶ディスプレイを備えた電子機器。  
【請求項2】 反射型液晶ディスプレイを表示部とする電子機器において、  
周囲の明るさを検出する検出手段と、  
前記検出手段で検出した明るさに応じて、前記反射型液晶ディスプレイのON/OFF、または表示画面のコントラスト調整を行う制御手段と、  
を設けたことを特徴とする反射型液晶ディスプレイを備えた電子機器。  
【請求項3】 レンズを介して入射する被写体光を光電変換し、被写体像を示す画像信号に変換する撮像素子と、  
表示手段として用いられる反射型液晶ディスプレイと、  
前記反射型液晶ディスプレイの表示画面を照明する照明手段と、  
周囲の明るさを検出する検出手段と、  
前記検出手段で検出した明るさに応じて、前記照明手段の点灯/消灯、または照明光の光量調整を行う制御手段と、  
から成ることを特徴とする反射型液晶ディスプレイを備えた電子カメラ。  
【請求項4】 レンズを介して入射する被写体光を光電変換し、被写体像を示す画像信号に変換する撮像素子と、  
表示手段として用いられる反射型液晶ディスプレイと、  
周囲の明るさを検出する検出手段と、  
前記検出手段で検出した明るさに応じて、前記反射型液晶ディスプレイのON/OFF、または表示画面のコントラスト調整を行う制御手段と、  
から成ることを特徴とする反射型液晶ディスプレイを備えた電子カメラ。  
【請求項5】 前記検出手段として、ストロボ露光センサが採用されることを特徴とする請求項3又は4記載の反射型液晶ディスプレイを備えた電子カメラ。  
【請求項6】 前記検出手段は、前記撮像素子と信号処理回路とから成ることを特徴とする請求項3の反射型液晶ディスプレイを備えた電子カメラ。  
【請求項7】 光学ファインダーと、  
前記光学ファインダーを撮影者が覗いているか否かを検出する第2の検出手段と、

前記第2の検出手段により撮影者が前記光学ファインダーを覗いていることが検出された場合に前記反射型液晶ディスプレイをOFFする第2の制御手段と、を具備したことと特徴とする請求項3又は4記載の反射型液晶ディスプレイを備えた電子カメラ。  
【請求項8】 前記第2の検出手段は光検出センサから成り、前記第1の検出手段として採用されることを特徴とする請求項3又は4記載の反射型液晶ディスプレイを備えた電子カメラ。  
【請求項9】 被写体の輝度分布に基づいて逆光を検出する第3の検出手段と、前記第3の検出手段により逆光であることが検出された場合に前記反射型液晶ディスプレイの表示画面のコントラストを高める調整を行う第3の制御手段と、を備えたことを特徴とする請求項3又は4記載の反射型液晶ディスプレイを備えた電子カメラ。  
【請求項10】 被写体の輝度分布に基づいて逆光を検出する第3の検出手段と、前記第3の検出手段により逆光であることが検出された場合に前記照明手段を点灯させ、または前記照明手段の光量を高める調整を行う第3の制御手段と、を備えたことを特徴とする請求項3記載の反射型液晶ディスプレイを備えた電子カメラ。

【発明の詳細な説明】  
【0001】  
【発明の属する技術分野】 本発明は、デジタルカメラ等の電子カメラや情報機器端末などのように反射型液晶ディスプレイを表示部として備えた電子機器に関する。

【0002】  
【従来の技術】 従来、デジタルカメラのモニタ画面として透過型液晶ディスプレイが用いられている。しかし、透過型液晶ディスプレイは、常にバックライトに駆動しなければならず、消費電力が大きいという欠点がある。これに対し、特開平8-242398号公報に開示された電子カメラは、被写体輝度を検出する露光手段を有し、被写体輝度に応じてバックライトの明るさを自動調整することにより、省電力化及びモニタ視認性の向上を図っている。

【0003】  
【発明が解決しようとする課題】 しかしながら、上記公報に開示されているように、バックライトの明るさを調整しても省電力に寄与する効果は小さく、更なる低消費電力化を図る上では、透過型液晶ディスプレイを用いる事は限界がある。そのため、透過型液晶ディスプレイに代えて、バックライトの不要な反射型液晶ディスプレイの採用が検討されている。反射型液晶ディスプレイは、消費電力が小さいという利点があるが、暗い場所では画面が見え難いという欠点がある。そのため、反射型液晶ディスプレイを用いるには、周囲が暗い環境では液晶表示面を補助光で照明する等の後者の対策を講じる必要がある。

【0004】 本発明は、このような事情に鑑みてなされ

たもので、消費電力を大幅に削減し、且つ、使用者が望むような動作等をしなくても自動的に最適な表示状態を得ることが出来る反写型液晶ディスプレイを備えた電子機器を提供することを目的とする。

#### [0005]

【要旨を解決するための手段】前記目的を達成するために請求項1に記載の発明は、反写型液晶ディスプレイを被示物とする電子機器において、反写型液晶ディスプレイの表示面を照明する照明手段と、周囲の明るさを検出する検出手段と、前記検出手段で検出した明るさに応じて、前記照明手段の点灯/消灯、または、照明光の光束強度を行う制御手段と、を設けたことを特徴とする。

【0006】本発明によれば、検出手段で周囲の明るさを検出し、周囲が十分に明るい場合には照明手段を点灯し、周囲が暗い場合には照明手段を点灯して反写型液晶ディスプレイの表示面を照明し周囲を見やすくする。また、特に照明手段のON/OFFを制御する以外に、検出手段で検出した明るさに応じて照明手段の照明光束を逐次調整し、より見やすい周囲表示を得るようにしてよい。これにより、省電力化を図ることができると共に、最適な表示品質を自動的に確保できる。

【0007】請求項1記載の発明は、反写型液晶ディスプレイを表示物とする電子機器において、周囲の明るさを検出する検出手段と、前記検出手段で検出した明るさに応じて前記反写型液晶ディスプレイのON/OFF、または表示面のコントラスト調整を行う制御手段と、を設けたことを特徴とする。この発明は、照明手段を用いない場合、即ち照明では反写型液晶ディスプレイを利用することが出来ない点に起因してなされたものであり、即ち、検出手段で周囲の明るさを検出し、周囲が十分に明るい場合には反写型液晶ディスプレイをONする一方、周囲が暗く表示面を照明できない状況下では断片的に反写型液晶ディスプレイは利用できないので、これをOFFして無駄な電力消費を抑えている。

【0008】また、周囲の明るさの範囲によってはコントラスト調整によって表示面が十分に見やすくなる場合があるため、検出手段で検出する明るさに応じて反写型液晶ディスプレイのコントラストを逐次調整化制御することも有効である。請求項1及び請求項2に記載したこれらの発明は、請求項3又は請求項4に記載したように、レンズを介して入射する被示物光を光電変換し、被示物光を示す画像部分に変換する画像素子を具備した電子カメラに適用することができる。この場合、請求項5又は請求項6に記載したように、電子カメラに付属するストロボ光センサーや、露出制御のための露光センサー、または、画像素子と信号処理回路とからなるA/E回路手段と前記検出手段として使用することが好ましい。

【0009】請求項7に記載の発明は、請求項3又は請求項4に係る電子カメラにおいて、更に、光学ファインダーと、前記光学ファインダーを撮影者が覗いているか

否かを検出する第2の検出手段と、前記第2の検出手段により撮影者が前記光学ファインダーを覗いていることが検出された場合に前記反写型液晶ディスプレイをOFFする第2の制御手段と、を設けたことを特徴としている。

【0010】撮影者が光学ファインダーを覗いているか否かを検出手段で検出し、撮影者が光学ファインダーを覗いている場合には、反写型液晶ディスプレイへの通電を遮断するようにした上で、無駄な電力消費を抑制することができ、また、特に、請求項8の如く、前記第2の検出手段に検出センサを用い、これを周囲の明るさを検出するための検出手段として使用することが好ましい。

なお、第2の制御手段は、請求項3又は4に係る電子カメラにおける制御手段と一体のものでよい。

【0011】請求項9に記載の発明は、請求項3又は請求項4に係る電子カメラにおいて、被示物の周囲分布に基づいて被示物を検出する第3の検出手段と、前記第3の検出手段により被示物であることが検出された場合に前記反写型液晶ディスプレイの表示面のコントラストを逐次調整を行う第3の制御手段と、を設けたことを特徴としている。かかる構成を付加した態様によれば、使用者（ユーザ）に最適な画像操作を強いることなく使用状況に応じてより最適な表示状態を自動的に提供することができ、なお、第3の制御手段は、請求項3又は4に係る電子カメラにおける制御手段と一体のものでよい。

【0012】また、請求項10に記載の如く、請求項3に係る電子カメラの構成に加えて、被示物の周囲分布に基づいて被示物を検出する第3の検出手段と、前記第3の検出手段により被示物であることが検出された場合に前記検出手段を点灯させ、または前記検出手段の光束を高める調整を行う第3の制御手段と、を設ける態様も可能である。

#### [0013]

【要旨の要旨の形態】以下添付図面に就いて本発明に係る反写型液晶ディスプレイを備えた電子機器の好ましい実施形態の形態について詳説する。図1は本発明の実施の形態に係る電子カメラの構成を示すブロック図である。図2に示すように、この電子カメラ10は、主として、図1の構成要素12、固体撮像素子（CCD）14、信号処理回路16、マイクロコンピュータ（マイコン）18、カメラ用反写型液晶ディスプレイ（LCD）20、及び前記LCD20の表示面を照明する補助光を与える光源22等から成る。

【0014】被示物を示す画像光は、図1の構成要素12を介してLCD14の受光面に結像される。LCD14は受光面に結像された画像光を、その光量に応じた量の信号電圧に変換し、このようにして検出された信号電圧は、CCD駆動回路（不図示）から加えられる駆動電圧に基づいて逐次転送され、信号電圧に応じた電圧信号（画像

信号）として取り出される。

【0015】LCD14から取り出された画像信号は信号処理回路18に加えられる。ここで、色分離、ゲイン調整、ガンマ補正、A/D変換その他の信号処理が行われ、信号処理回路18で生成された画像データはデコーダ12に送られ、液晶制御回路24を介してLCD20に供給される。こうして、LCD14が捉えた映像がLCD20に表示される。

【0016】制御回路26のリレーズスイッチ等から成る照明制御回路28の受入部は、LCD20にプレビュー画像（本映像の前にモニタする映像又は前回撮像が表示され、撮影開始信号を受入するとLCD14から取り出された画像信号は、信号処理回路18で所定の処理を経て、LCD20に停止画像を表示する。これと同時に、液晶制御回路24は、この画像データに基づいて逐次転送される。メモリカード28等は、必要に応じて圧縮処理され、メモリカード28等の記憶媒体に記録される。なお、記録媒体の形態は、スマートメディアやICカード等、種々の形態が可能であり、被示物自在外部記憶媒体に限らず内蔵メモリでもよい。また、撮影開始信号はリモコンや外部接続機器などにより電子カメラ10の外部から加えられる場合もある。上述の駆動回路が完了すると、画面のフリーズを解し、画面又は前回表示に戻る。

【0017】また、メモリカード28に保存した画像データはマイコン18の制御に基づいて読み出しが可能であり、取り出された画像データは必要に応じて伸張処理された後、液晶制御回路24を介してLCD20に出力される。こうして、LCD20には再生画像が表示され、LCD20の詳細な情報は図示しないが、基本的に、表示電圧を有する1列の透明板の間に液晶が封入され、その外周にフィルム使用領域と偏光板を配置して、入射光線と反射光線とに反射光線と偏光板を配置して、入射光線と反射光線とにその光線と反射光線とをそれぞれ表示を行うものである。このLCD20は、被

品制御回路24を介してマイコン18によって制御され、詳しくは後述するが、周囲の明るさや被示物の輝度分布に応じて自動的にコントラストの調整が行われる。また、周囲が暗い場合には、光源22を点灯してLCD20の表示面を照明する。光源22には、蛍光管、LED、白色LEDなど、種々の形態を用いることが可能である。

【0018】光源22は、液晶制御回路30を介してマイコン18によって制御され、周囲の明るさに応じて自動的に点灯/消灯が行われ、共に、光源の輝度（照射光の光量）の調整が行われる。その一方、手動操作作用の照明スイッチ32も設けられ、ユーザがこのスイッチを操作すると、マイコン18は照明スイッチ32の指示を光源制御回路24により優先させ、スイッチ操作に従って光源22をON/OFF又は調整する。これにより、ユーザは必要に応じて即時光源22を点灯/消

灯/消光できる。

【0019】マイコン18は、パワースイッチ、リレーズスイッチ等の操作部20からのスイッチ操作に基づいて各回路を逐次制御するもので、CCD14の駆動制御やメモリカード28の読み書きを制御する他、所定のプログラムに従って露出値、フォーカス位置等の各種調整を行い、自動露光制御、オートフォーカス、オートストロボ、オートホワイトバランス等の制御を行う。

【0020】即ち、マイコン18は、信号処理回路18から出力される画像信号の露光平均値や、現在の明るさ及び電子シャッタースピードに基づいて被示物の明るさ（被示物輝度）並びに露光分布を求め、そして、求めた被示物の明るさに基づいて、絞り値やCCD14の電荷蓄積時間（電子シャッタースピード）を決定し、決定した絞り値に基づいて絞り機構を制御すると共に、電子シャッタースピードに基づいてCCD駆動回路を制御する。

【0021】このように、CCD14からの出力信号は信号処理回路18で処理することによって被示物の明るさ、即ち、周囲の明るさを検出し、その検出結果に基づいて絞り22やLCD20を制御する。なお、周囲の明るさを検出する手段は、これに限らず、専用の測光素子を設けてもよいし、露出計として使用される測光素子でもよい。また、ストロボ用測光センサ34や、光学ファインダー38の検出センサ38を使用してもよく、同様の形態でもよい。

【0022】オートフォーカス手段は種々の形態が可能であるが、例えば、画像信号から被示物像の輝度値を示す焦点距離値を算出し、その焦点距離値を利用してフォーカス位置を算出し、算出したフォーカス位置に従ってフォーカス駆動回路（不図示）を介して駆動レンズ12を制御し、フォーカス位置を設定する。その他、AFセンサなど公知の距離手段を用いてもよい。

【0023】また、マイコン18はストロボが露光センサ34で検出した周囲の明るさに応じてストロボ36を制御する。光学ファインダー38の検出部（電圧感）近傍には、光検出センサ40が設けられている。この光検出センサ40は、撮影者が光学ファインダー38を覗いているか否かを検出する手段であり、例えば、受光センサが用いられる。ファインダー検出部に撮影者の顔が近づくと、検出部周辺が撮影者の顔によってセンサ受入光量が変化することを利用して、撮影者が光学ファインダー38を覗いているか否かを検出する。

【0024】その他、露光部と受光部から成る光検出センサ40を用い、ファインダー検出部に撮影者の顔が近づいた場合に、露光部から出射された光が撮影者の顔で反射されて受光部に入射する光量の変化に基づいて撮影者が光学ファインダー38を覗いているか否かを検出す





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